DOCUMENT RESUME

ED 285 337 EC 200 274

AUTHOR Proctor, Adele
TITLE Tactile Aid Usage with Young Hearing-Impaired Children.
PUB DATE Nov 86
NOTE 25p.; Paper presented at the Annual Convention of the American Speech-Language-Hearing Association (Detroit, MI, November 21-24, 1986).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Communication Aids (for Disabled); Expressive Language; *Hearing Impairments; *Language Acquisition; *Lipreading; *Listening Comprehension; Oral Language; Preschool Education; Receptive Language; *Sensory Aids; *Tactual Perception
IDENTIFIERS *Vibrotactile Aids

ABSTRACT

Five hearing impaired children (2 to 4 years old) were followed longitudinally while using a single channel, vibrotactile aid as a supplement to hearing aids. Standardized language tests (including the Scales of Early Communication Skills for Hearing Impaired Children, the Test for Auditory Comprehension of Language, and the Test for Auditory Comprehension of Language-Revised) measured the rate of progress in receptive and expressive language. Subjects were compared with each other and with same-aged hearing and hearing impaired peers. Pre- and post-test scores revealed an increased rate of progress in lipreading and other aspects of oral language after tactile stimulation was introduced. Data also suggested that tactile stimulation helps develop auditory awareness faster, thereby allowing for improved response to sound which, in turn, can lead to more accurate hearing tests at earlier ages. (Author/CL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED285337

Tactile Aid Usage With Young Hearing-Impaired Children

Adele Proctor, Sc.D.
Associate Professor
Northeastern Univeristy

Presented to the Meeting of the American Speech-Language-Hearing Association
Detroit, MI, November, 1986

EC 200 374

BEST COPY AVAILABLE

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Adele Proctor
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Tactile Aid Usage With Young Hearing-Impaired Children. Adele Proctor, Sc.D. Associate Professor, Northeastern University, Boston, MA 02115.

ABSTRACT: A total of five hearing-impaired children were followed longitudinally while using a single channel, vibrotactile aid. Standardized language tests were used to measure rate of progress in receptive and expressive language. Subjects were compared with each other and with same aged hearing and hearing-impaired peers. Pre-post-test scores revealed an increased rate of progress in lipreading and other aspects or oral language after tactile stimulation was introduced.

Tactile Aid Usage with Young Hearing-Impaired Children. Adele Proctor, Sc.D., Northeastern University, Boston, MA and The Institute of Logopedics, Wichita, KS.

Introduction and Purpose:

Since the pioneering work of R. H. Gault in the 1920s, other researchers have designed different types of tactile instruments with the overall purpose of enhancing oral communication, language and speech of deaf users. Generally, clinical and experimental research conducted since Gault's original 'Teletactor' suggest that prosthetic devices, providing some type of tactile stimulation, will improve lipreading, speech, voice quality and are useful in teaching language to young hearing-impaired children [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13].

In light of the previous research, the overall objective of this study was to further delineate the amount and type of benefit that a single channel vibrotactile aid would provide prelinguistic, profoundly hearing-impaired children. The specific aim was to determine if children would exhibit an increased rate of progress in lipreading and expressive language after using a single channel aid.

Method

Subjects

Subjects included four prelinguistic, profoundly hearing-impaired children (S1, S2, S3, S5) and one language impaired child with a severe hearing loss (S4). The five children ranged in age from 24 months to 53 months at onset of tactile aid usage and all were enrolled in total communication programs (signed English and oral language). All were fitted with binaural amplification and used the Phonic Ear FM system at school. Of the total, four subjects used

a single channel tactile aid designed at Johns Hopkins University [7, 8, 11, 12] for 35 hours of individual speech-language therapy per 12 month period. The fifth subject wore a commercially available Tactaid for four to five hours per day [14]. As determined by nonverbal tests, all subjects exhibited normal or above normal cognitive function.

Procedures

The general procedure for measuring rate of progress in receptive and expressive language followed a pre-test-post-test design. Standardized language tests were administered before, during and after tactile aid usage. The tests used included The Scales of Early Communication Skills for Hearing-Impaired Children (SECS), the Test for Auditory Comprehension of Language and the Test for Auditory Comprehension of Language - Revised (TACL and TACL-R).

The Vibrotactile Aids Used:

The device is essentially an envelope detector, i.e., detects when the speech signal is present. The amplitude is modulated so that gross sound patterns can be felt on the skin. Rhythm, stress and duration patterns of the child's own speech and that of others are tactually perceptible. For the Hopkins aid, the electronics, the microphone and batteries are located in a leather case and the case is connected to sturdy elastics which hold the vibrator in place at the sternum. The case can be attached to a belt or straps on pants worn by children.

In the Tactaid I, the electronics, batteries and sensitivity control dial are enclosed in a light weight plastic case with the microphone situated on top of the case. As in the Hopkins aid, similar sturdy elastic straps are used to hold the vibrator, Radioear B72, in place at the sternum. A simple metal clasp is used to hold the case in place on the elastics (see Figure 1).

In this study, the tactile aid was used as a supplement to hearing aids. Hearing aids were not removed during tactile aid usage.

Summary of Results

Figures 2 to 4 and Tables 1 to 3 show results of pre-post-test receptive and expressive language percentile ranks for the SECS and suggest that four prelinguistic, profoundly deaf children and one language impaired child with a severe hearing loss increased rates of understanding and producing oral language after use of the tactile aid was initiated. Compared to hearing impaired peers of similar ages, before tactile aid usage, these five subjects consistently scored below average. After a single channel, vibrotactile aid was introduced into their educational programs, the five subjects scored above average when compared to hearing impaired children of comparable ages.

Direction of improvement for receptive and expressive language of the five subjects was found to be statistically significant, determined by a sign test applied to standard score results of the SECS. Subjects scored above what is expected as normal variation in that standard deviations (SD) shifted in relative positions with greater improvement seen in receptive than in expressive language skills.

Figures 6 and 7 show pre-post-test age equivalent scores attained on the TACL and the TACL-R, receptive language tests normed on hearing children, and were used as measures of lipreading. Pre-post-test results revealed that the five subjects exhibited a linear pattern of upward progression and a rapid rate of progress in learning to lipread after onset of tactile aid usage. On the TACL, one subject obtained a language equivalent score slightly above what is expected of same aged hearing children, a second subject achieved a score at the lower end of the normal range of performance expected of hearing peers

and scores for two other subjects, although delayed, demonstrated that they continued to narrow the gap between expected performance and actual performance, despite presence of a language impairment in one child.

Pre-post-test age equivalent scores on the TACL-R for a fifth subject (Figure 8 and Table 3) revealed that she exceeded the average levels of expected progress over a six month interval. Compared with same aged hearing peers, she achieved an above average age equivalent score on one subtest of the TACL-R and for the other two subtests, approached average age levels expected of hearing children.

Discussion

Although pre-post-test score results suggest that subjects made considerable progress and showed an increased rate of acquisition for receptive and expressive language after onset of tactile stimulation, maturation, amount of individualized instruction, school curriculum and management of child and family cannot be ruled out as contributing factors. These subjects do, however, show the same types of gains in lipreading previously found for two other deaf children who used the same type of tactile aid [6, 7, 12].

The quantitative and qualitative gains in oral language comprehension (lipreading) and general communicative abilities found for subjects S1, S2, S3, and S4 cannot be attributed to their academic programs only since each child had a significant amount of previous training, by many of the same teachers, before tactile aid usage and had not previously demonstrated such a rapid rate of learning to lipread. The data for the hearing impaired/language impaired child suggest that tactile stimulation assists in developing auditory awareness faster and thereby allows for improved response to sound enabling the audiologist to obtain a more accurate hearing test earlier than can often be achieved for

young hearing impaired children.

S4 had only six months of training before tactile stimulation was initiated. A comparison of her performance with the older subjects, who had what is considered a minimum amount of tactile stimulation, suggests that: (1) a minimum amount of tactile stimulation, e.g., during individual speech and language therapy, will be beneficial in increasing rate of understanding and producing oral language and; (2) initiation and use of tactile stimulation at the earliest possible age will provide increased benefits in facilitating language acquisition of prelinguistic, profoundly deaf children.

REFERENCES

1. Gault, R.H. Progress in experiments on tactual interpretation of oral speech. J. Abnormal and Social Psychology 1924;19:155-159.

2. Gault, R.H. Touch as a substitute for hearing in the interpretation and control of speech. Archives of Otolaryngology 1926a;3:121-135.

3. Gault, R.H. The interpretation of speech by tactual and visual impression. Archives of Otolaryngology 1926b;4:228-239.

4. Bond, S.L. and Scott, B.L. Evaluating a tactile aid on 4 year old profoundly deaf children. J. Acoustical Society of America 1982;71:S59.

5. Friel-Patti, S. and Roeser, R.J. Evaluating changes in the communication skills of deaf children using vibrotactile stimulation. Ear and Hearing 1983;4:31-39.

6. Geers, A., Miller, J.M. and Gustus, C. Vibrotactile stimulation-case study with profoundly deaf child. Paper presented at the Meeting of the American Speech-Language-Hearing Association, Cincinnati, Ohio, November(1983).

7. Goldstein, M.H., Proctor, A., Bulle, L. and Shimizu, H. Tactile stimulation in auditory reception: Experience with a nonauditory child. In: Hochberg I, Levitt H and Osberger MJ, eds. Speech of the hearing impaired child: Research, training and personnel preparation. Baltimore: University Park Press, 1983:147-166.

8. Goldstein, M.H. and Proctor, A. Tactile aids for profoundly deaf children. J. Acoustical Society of America 1985;59:1477-1481.

9. Goodfellow, L.D. Experiments in the sense of touch and vibration. J. Acoustical Society of America 1934;6:45-50.

10. Oller, D.K., Eilers, R., Vergara, K. and LaVoie, E. Tactual vocoders in a multisensory program training speech production and reception. Volta Review 1986;88:21-36.

11. Proctor, A. and Bickley, C. Application of acoustic analysis to clinical assessment of deaf children's speech production. In: Taylor IG and John JEJ eds. Proceedings of the International Congress on Education of the Deaf 1985.Manchester, England:Manchester University Press, 1986.

12. Proctor, A. and Goldstein, M.H., Jr. Development of lexical comprehension in a profoundly deaf child wearing a vibrotactile communication aid. Language, Speech and Hearing Services in Schools 1983;14:138-149.

13. Sheehy, P. and Hansen, S.A. The use of vibrotactile aids with hearing impaired children: Case studies. Volta Review 1983;85:14-26.

14. Franklin, C. Tactile aids:New help for the profoundly deaf. The Hearing Journal Feb.,1984;20-24

Figure Legends

1. Figure 1. Erin (S5) Wearing TactAid
2. Sigure 2. Pre-Post Test Receptive Percentile Ranks: SECS
3. Figure 3. S5: Pre-Post Test Receptive Percentile Ranks: SECS
4. Figure 4. Pre-Post Test Expressive Percentile Ranks: SECS
5. Figure 5. S5: Pre-Post Test Expressive Percentile Ranks: SECS
6. Table 1. Changes in Standard Scores for Receptive Language: SECS
7. Table 2. Changes in Standard Scores for Expressive Language: SECS
8. Figure 6. TACL Scores for Four Different Subjects
9. Figure 7. Group Age Equivalent Scores for Four Subjects
10. Figure 8. S5: Percentile Ranks on the TACL-R
11. Table 3. S5: Changes in Age Equivalent Scores on the TACL-R

Figure 1

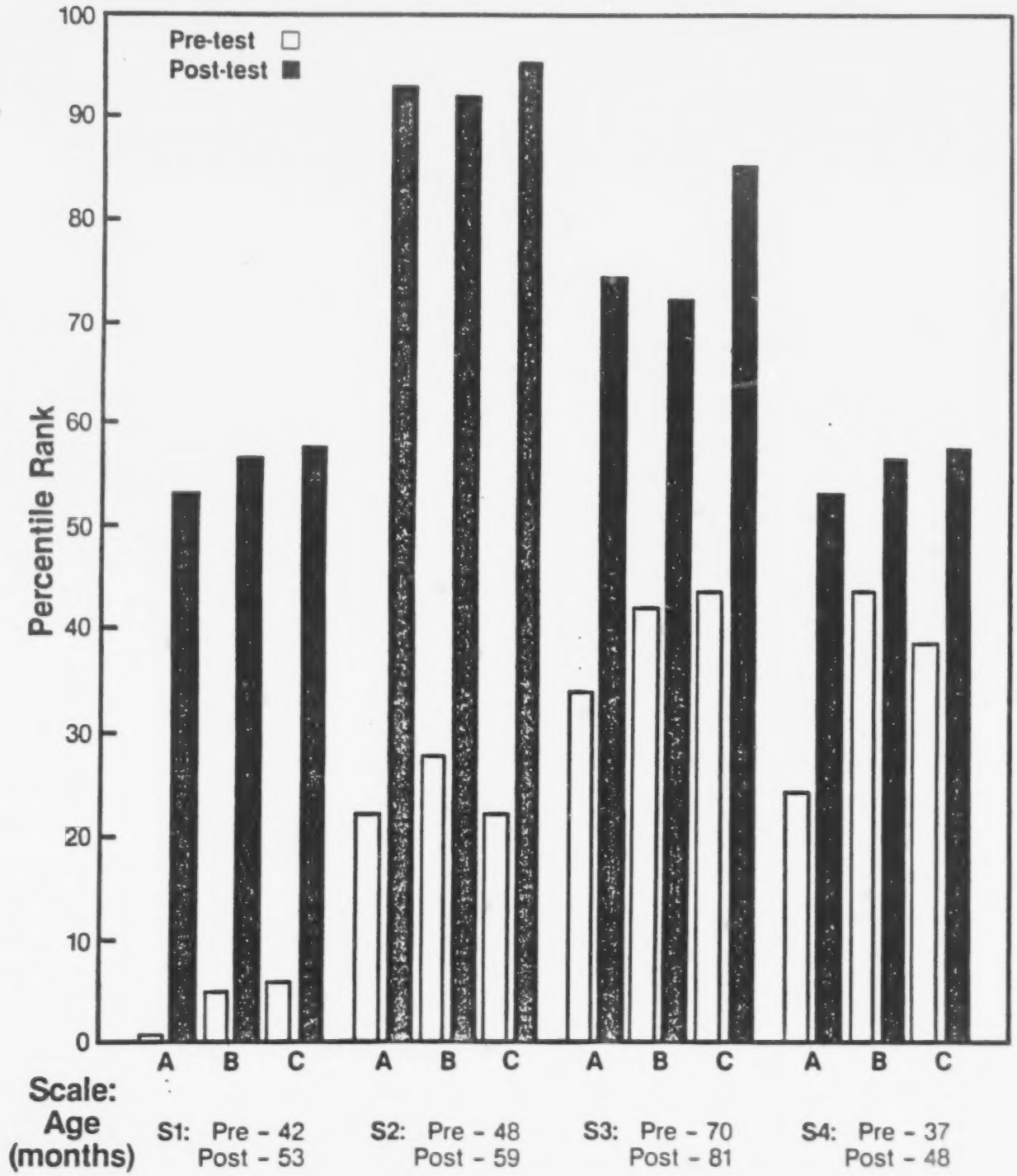
Pre-test
Post-test
Percentile Rank
100
90
80
70
60
50
40
30
20
10
0
A B C A B C A B C A B C
Scale:
Age
(months)
S1: Pre - 42
Post - 53
S2: Pre - 48
Post - 59
S3: Pre - 70
Post - 81
S4: Pre - 37
Post - 48

Figure 2

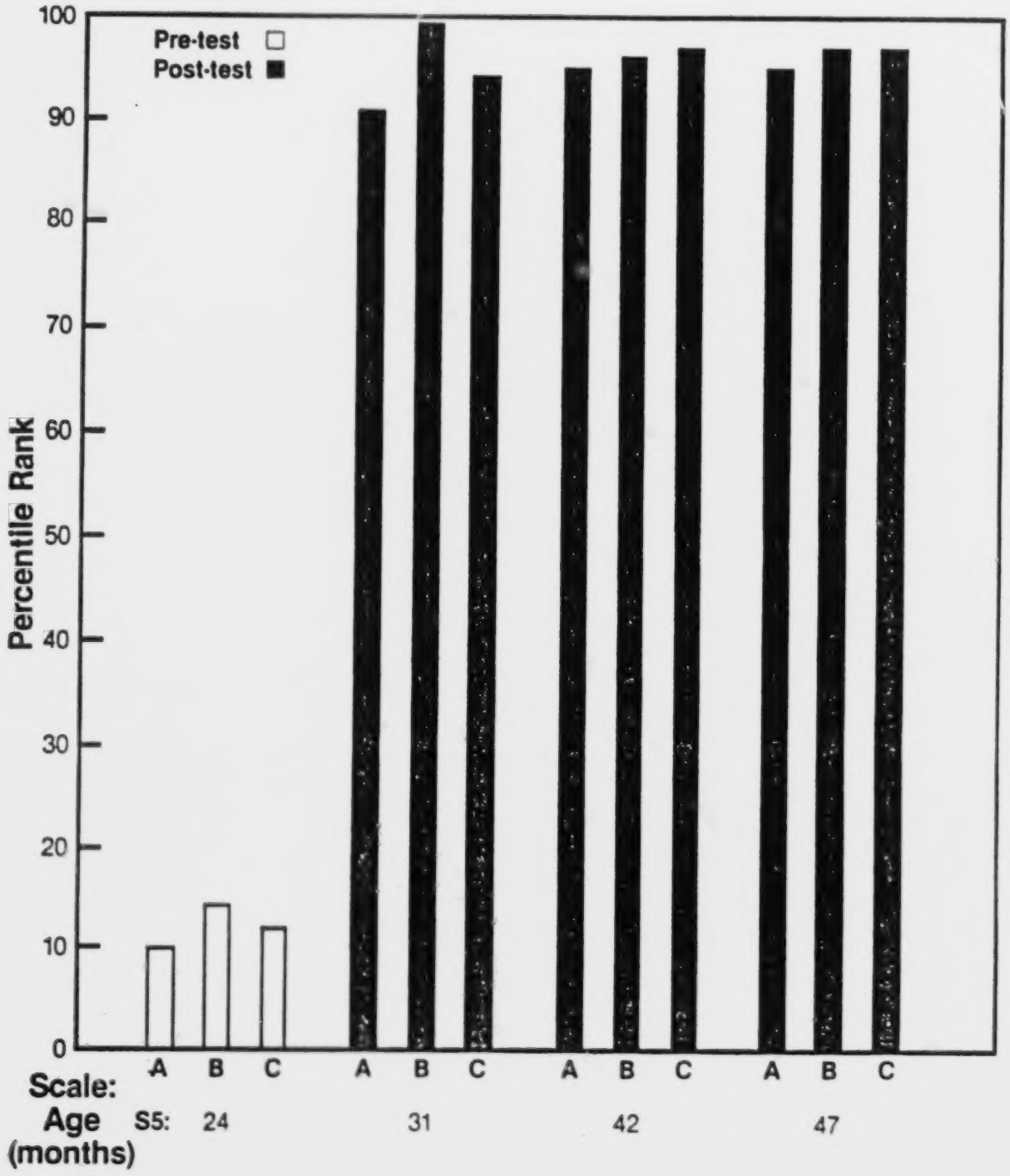
Pre-test
Post-test
Percentile Rank
100
90
80
70
60
50
40
30
20
10
0
A B C A B C A B C A B C
Scale:
Age S5: 24 31 42 47
(months)

Figure 3

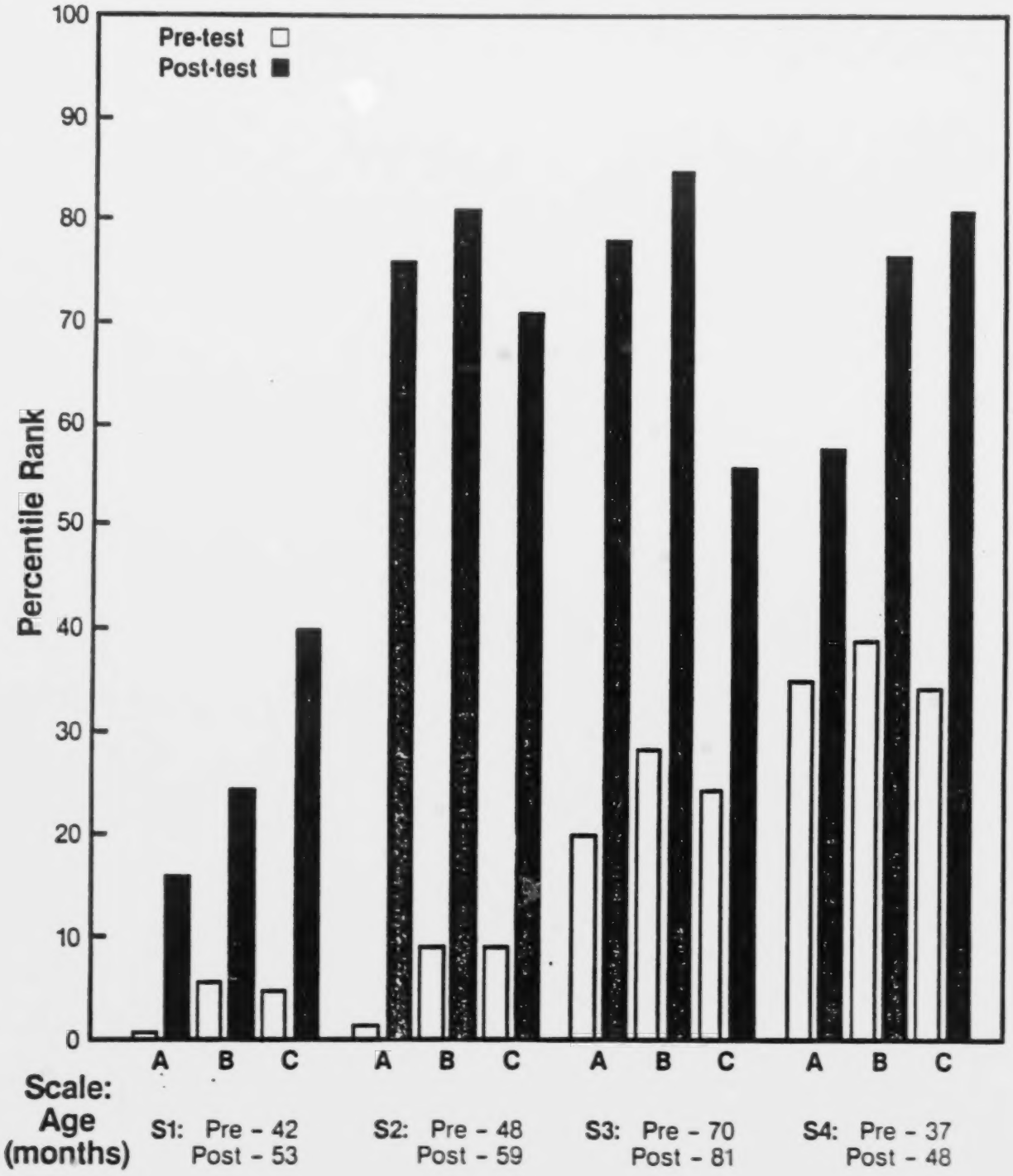
Pre-test
Post-test
Percentile Rank
100
90
80
70
60
50
40
30
20
10
0
A B C A B C A B C A B C
Scale:
Age
(months)
S1: Pre - 42
Post - 53
S2: Pre - 48
Post - 59
S3: Pre - 70
Post - 81
S4: Pre - 37
Post - 48

Figure 4

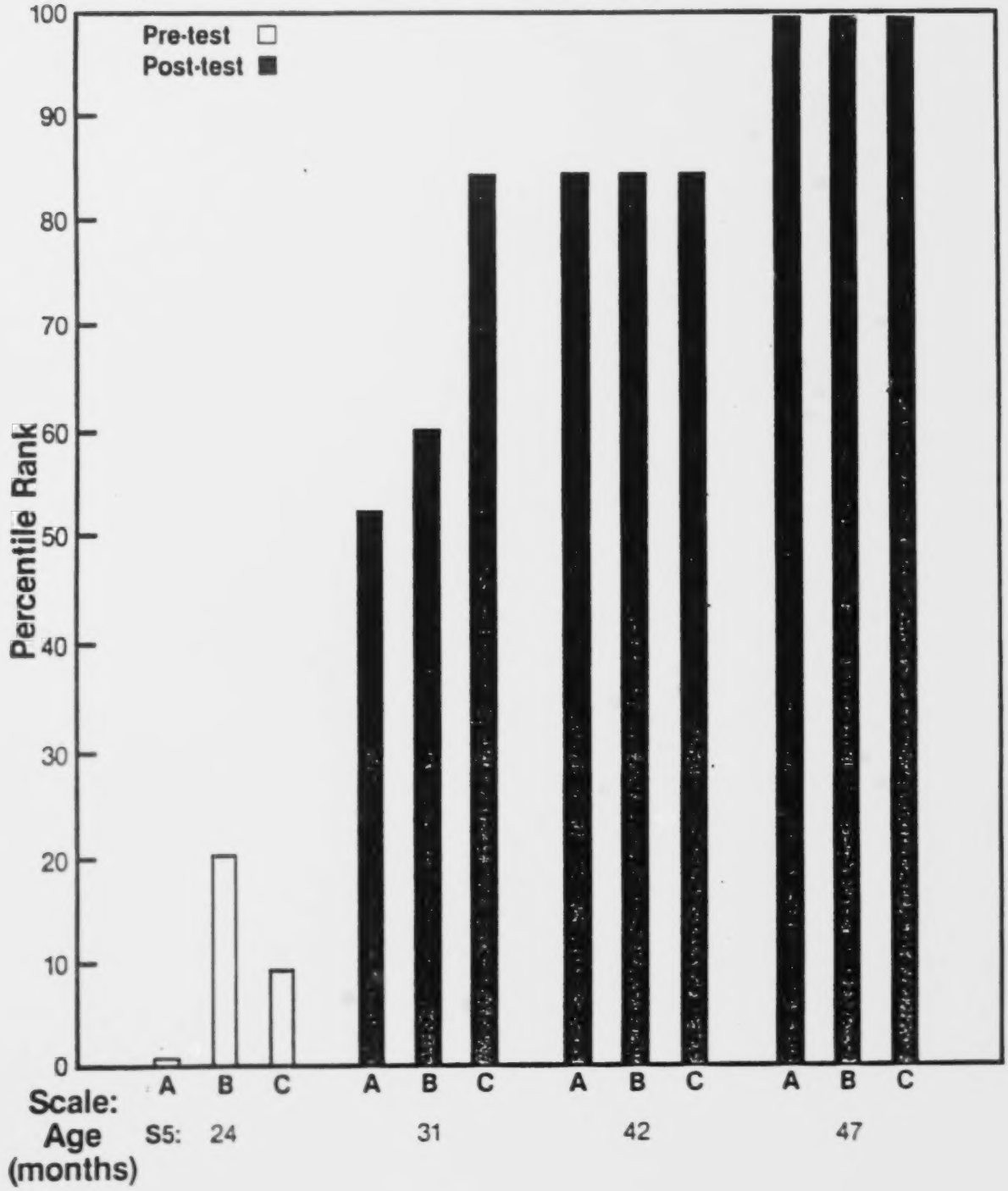
Pre-test
Post-test
Percentile Rank
100
90
80
70
60
50
40
30
20
10
0
A B C A B C A B C A B C
Scale:
Age S5: 24 31 42 47
(months)

Figure 5

Table 1. Changes in Standard Scores for Receptive Language: SECS

PRE-TEST			POST-TEST			STANDARD SCORE	
Subject & Age (mos)	Scales* A	B	Subject & Age (mos)	Scales A	B	Gain (+) A	Loss (-) B
S1: 42	0	36.3	S1: 53	51.8	52.6	+51.8	+16.3
S2: 48	41.4	44.5	S2: 59	63.8	64.4	+21.4	+19.9
S3: 70	47.1	48.8	S3: 81	57.7	52.1	+10.6	+ 3.3
S4: 37	41.2	45.7	S4: 48	51.8	52.6	+10.6	+ 6.9
S5: 24	39.9	39.9	S5: 31	67.2	88.9	+27.3	+49.0

* There is no Scale C for standard scores on the SECS

Table 2. Changes in Standard Scores for Expressive Language: SECS

PRE-TEST			POST-TEST			STANDARD SCORE	
Subject & Age (mos)	Scales* A	B	Subject & Age (mos)	Scales A	B	Gain (+) A	Loss (-) B
S1: 42	0	0	S1: 53	38.7	42.0	+38.7	+42.0
S2: 48	34.2	37.9	S2: 59	59.0	60.5	+13.3	+15.6
S3: 70	40.8	46.8	S3: 81	59.1	59.3	+18.3	+12.5
S4: 37	40.8	46.8	S4: 48	59.0	60.5	+13.3	+15.6
S5: 24	0	42.6	S5: 31	50.4	50.6	+50.4	+ 8.0

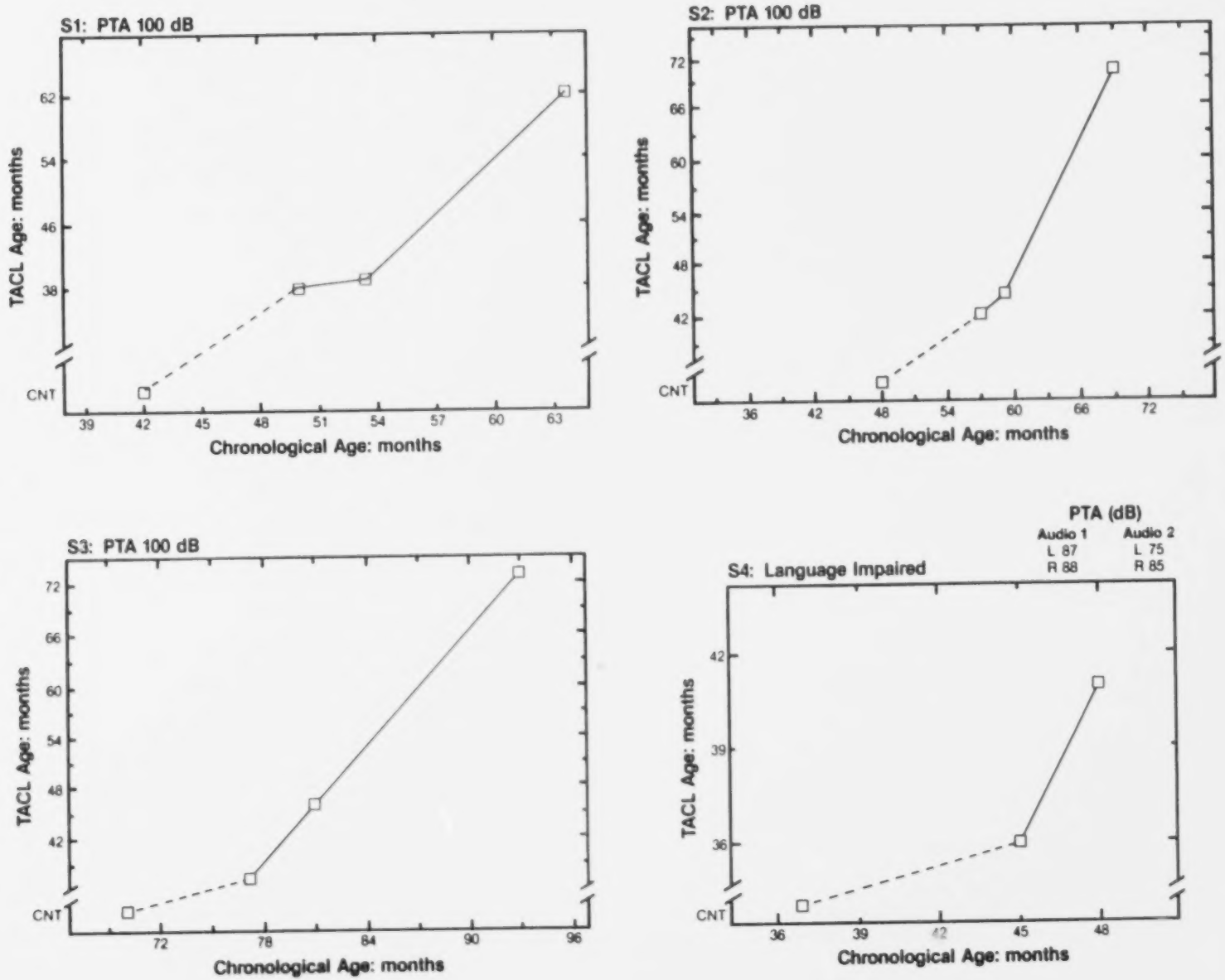
S1: PTA 100 dB
TACL Age: months
62
54
46
38
CNT
39
42
45
48
51
54
57
60
63
Chronological Age: months
S2: PTA 100 dB
TACL Age: months
72
66
60
54
48
42
CNT
36
42
48
54
60
66
72
Chronological Age: months
S3: PTA 100 dB
TACL Age: months
72
66
60
54
48
42
CNT
72
78
84
90
96
Chronological Age: months
PTA (dB)
Audio 1
L 87
R 88
Audio 2
L 75
R 85
S4: Language Impaired
TACL Age: months
42
39
36
CNT
36
39
42
45
48
Chronological Age: months

Figure 6

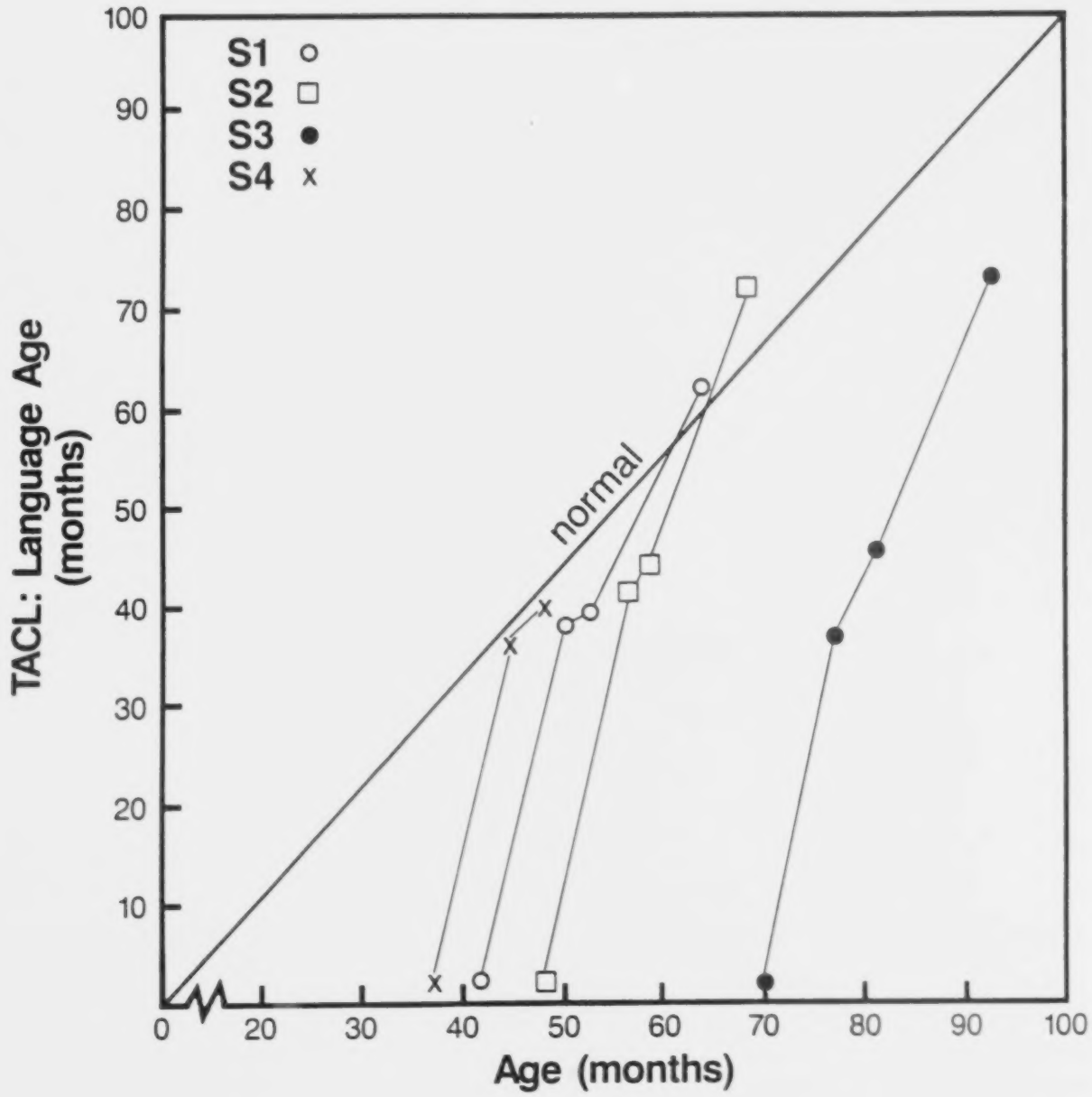
S1
S2
S3
S4
normal
TACL: Language Age (months)
Age (months)
100
90
80
70
60
50
40
30
20
10
0
20
30
40
50
60
70
80
90
100

Figure 7

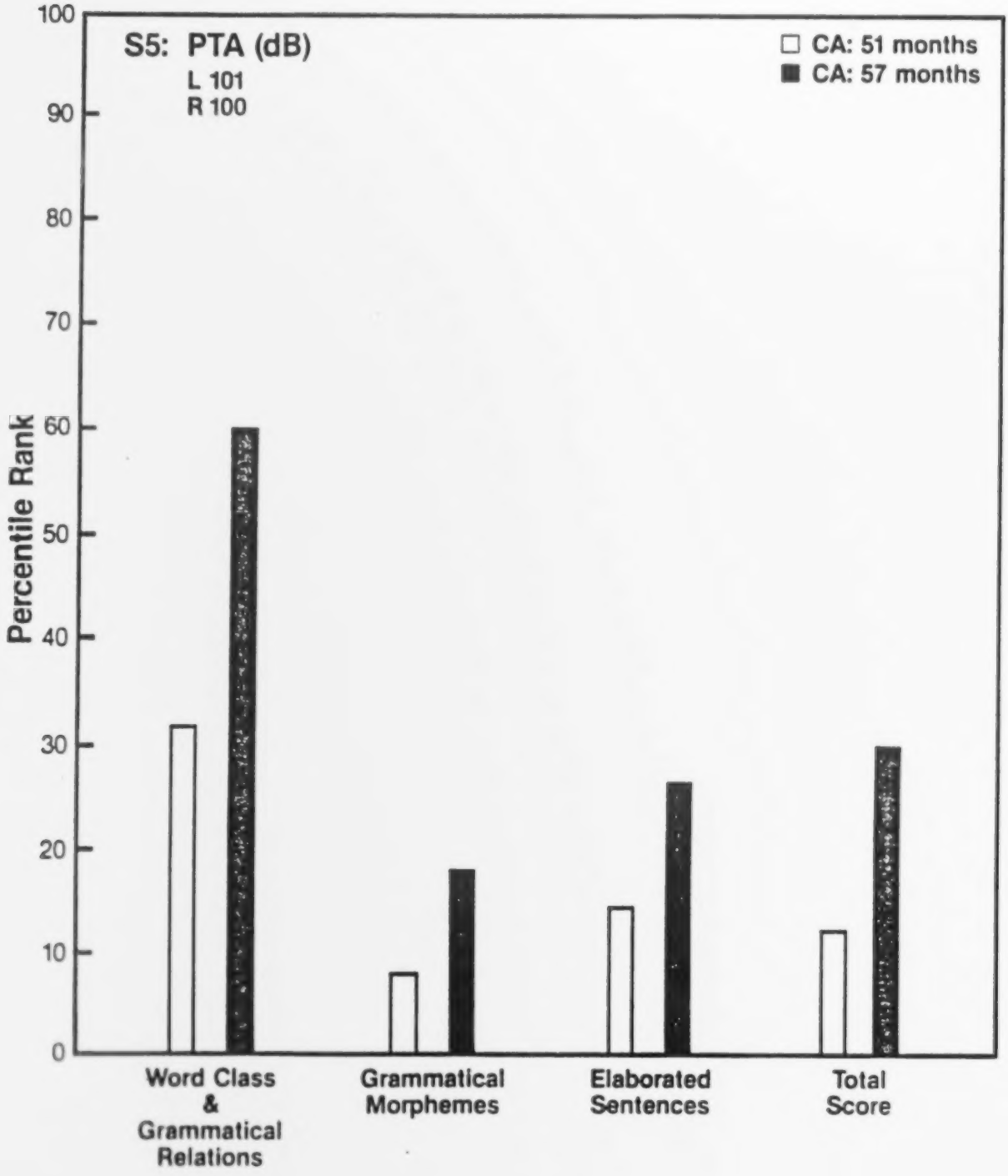
S5: PTA (dB)
L 101
R 100
CA: 51 months
CA: 57 months
Percentile Rank
100
90
80
70
60
50
40
30
20
10
0
Word Class & Grammatical Relations
Grammatical Morphemes
Elaborated Sentences
Total Score

Figure 8

Table 3. S5 - Changes in Age Equivalent Scores on TACL - R

	PRE-TEST (51 mos)	POST-TEST (57 mos)	GAIN (+) LOSS (-) ($\bar{X}$ age in mos)
Test Category	Age Equivalent Scores		
Word Class & Grammatical Relations	45 - 48	57 - 62	+ 13
Grammatical Morphemes	36 - 39	46 - 49	+ 8
Elaborated Sentences	36 - 39	46 - 49	+ 10
Total Score	40 - 42	49 - 51	+ 9